

## 1. PUBLIC HEALTH STATEMENT

This public health statement tells you about 1,4-dichlorobenzene and the effects of exposure.

The Environmental Protection Agency (EPA) has identified 1,467 hazardous waste sites as the most serious in the nation. These sites make up the National Priorities List (NPL) and are targeted for long-term federal clean-up activities. 1,4-Dichlorobenzene has been found in at least 281 NPL sites. However, the total number of NPL sites evaluated for this substance is not known. As more sites are evaluated, the sites at which 1,4-dichlorobenzene is found may increase. This information is important because exposure to this substance may harm you and because these sites may be sources of exposure.

When a substance is released from a large area, such as an industrial plant, or from a container, such as a drum or bottle, it enters the environment. This release does not always lead to exposure. You can be exposed to a substance only when you come in contact with it by breathing, eating, touching, or drinking.

If you are exposed to 1,4-dichlorobenzene, many factors determine whether you'll be harmed. These factors include the dose (how much), the duration (how long), and how you come in contact with it. You must also consider the other chemicals you're exposed to and your age, sex, diet, family traits, lifestyle, and state of health.

### 1.1 WHAT IS 1,4-DICHLOROBENZENE?

The chemical 1,4-dichlorobenzene is usually called para-DCB or p-DCB, but there are about 20 additional names for it, including para crystals and paracide. It is also called paramoth because it is one of two chemicals commonly used to make mothballs. 1,4-Dichlorobenzene is used to make deodorant blocks used in garbage cans and restrooms, as well as to help control odors in animal-holding facilities. 1,4-Dichlorobenzene has also been used as an insecticide on fruit and as an agent to control mold and mildew growth on tobacco seeds, leather, and some fabrics.

At room temperature, 1,4-dichlorobenzene is a white solid with a strong odor that you would probably recognize as the smell of mothballs. When a package of 1,4-dichlorobenzene is opened, it slowly changes from a solid into a vapor and is released into the atmosphere. The released vapor acts as a deodorizer and insect killer. Most of the 1,4-dichlorobenzene that is released to the general environment is present as a vapor. 1,4-Dichlorobenzene can burn, but does not burn easily. Most people begin to smell 1,4-dichlorobenzene when it is present in the air at a concentration of 0.18 parts per million (ppm) and in water at a concentration of 0.011 ppm.

1,4-Dichlorobenzene does not occur naturally, but is produced by chemical companies to make products for home use and other chemicals such as resins. More information on the properties and uses of 1,4-dichlorobenzene may be found in Chapters 3 and 4.

## **1.2 WHAT HAPPENS TO 1,4-DICHLOROBENZENE WHEN IT ENTERS THE ENVIRONMENT?**

Most of the 1,4-dichlorobenzene enters the environment as a result of its uses in moth-repellant products and in toilet-deodorizer blocks. Because it changes from a solid to a gas easily, almost all of what is produced is released into the air. Some 1,4-dichlorobenzene is released to the air by factories that make or use it, and minor amounts are released to soil and water. Very little 1,4-dichlorobenzene enters the environment from hazardous waste sites.

Because 1,4-dichlorobenzene does not dissolve easily in water, the small amounts that enter bodies of water quickly evaporate into the air. If it is released to groundwater, it may be transported to surface water. Depending on conditions, some 1,4-dichlorobenzene may bind to soil and sediment. 1,4-Dichlorobenzene in soil is not usually easily broken down by soil organisms. There is evidence that plants and fish absorb 1,4-dichlorobenzene. It has been detected at concentrations up to 400 ppb in fish.

More information on the fate of 1,4-dichlorobenzene in the environment may be found in Chapters 4 and 5.

### 1.3 HOW MIGHT I BE EXPOSED TO 1,4-DICHLOROBENZENE?

Humans are exposed to 1,4-dichlorobenzene mainly by breathing vapors from 1,4-dichlorobenzene products used in the home, such as mothballs and toilet-deodorizer blocks. Reported levels of 1,4-dichlorobenzene in some homes and public restrooms have ranged from 0.29 to 272 parts of 1,4-dichlorobenzene per billion parts (ppb) of air. Outdoor levels of 1,4-dichlorobenzene are much lower, and reported levels in cities range from 0.02 to 20 ppb. Even levels in the air around hazardous waste sites are low; reported levels range from 0.03 to 4.25 ppb.

1,4-Dichlorobenzene has also been found in 13% of the drinking water samples from U.S. surface water sources. The surface water samples measured contain about 0.008-154 ppb of 1,4-dichlorobenzene. 1,4-Dichlorobenzene is less likely to be found in drinking water from wells. Levels of 1,4-dichlorobenzene in soil measured around hazardous waste sites in the United States average about 450 ppb. However, background levels of 1,4-dichlorobenzene in soil that is not around waste sites are not known.

1,4-Dichlorobenzene has also been detected in foods such as beef, pork, chicken, and eggs. This is because 1,4-dichlorobenzene is sometimes used as an odor-control product around animal stalls. 1,4-Dichlorobenzene has been found in fish; levels of 1-4 ppb were measured in trout caught in the Great Lakes.

The average daily adult intake of this chemical is estimated to be about 35 micrograms ( $\mu\text{g}$ ), which comes mainly from breathing vapors of 1,4-dichlorobenzene that are released from products in the home. These levels are not expected to result in harmful effects.

Workers may be exposed to 1,4-dichlorobenzene in workplace air at much higher levels than those to which the general public is exposed. Levels measured in the air of factories that make or process 1,4-dichlorobenzene products have ranged from 5.6 to 748 ppm of air. About 35,000 people in the United States are exposed to very low concentrations of 1,4-dichlorobenzene in the workplace.

More information on how you might be exposed to 1,4-dichlorobenzene is given in Chapter 5.

#### **1.4 HOW CAN 1,4-DICHLOROBENZENE ENTER AND LEAVE MY BODY?**

The main way 1,4-dichlorobenzene enters your body is through the lungs when you breathe in 1,4-dichlorobenzene vapors released in the workplace or from home use of products that contain 1,4-dichlorobenzene. When you breathe in this chemical for a few hours, as much as 20% of the 1,4-dichlorobenzene that has entered your body will get into your bloodstream.

1,4-Dichlorobenzene can also get into your body if you drink water that contains this chemical or if you eat certain foods that contain 1,4-dichlorobenzene, such as meat, chicken, eggs, or fish. Most of the 1,4-dichlorobenzene that enters your body from food and water will get into your bloodstream. It is not known if 1,4-dichlorobenzene can enter your body through the skin if you touch products that contain it.

There is also a possibility that 1,4-dichlorobenzene used in the home can be accidentally swallowed, especially by young children. When 1,4-dichlorobenzene is used in mothballs or deodorant blocks, these products may be freely available in closets or bathrooms.

Of the 1,4-dichlorobenzene that enters your body, most of it (perhaps more than 95%) leaves through the urine in less than a week. Another 1-2% leaves in the feces, and about 1-2% leaves in the air that you breathe out. Tiny amounts remain in your fat and may stay there for a long time.

In your body, most 1,4-dichlorobenzene is changed to the chemical 2,5-dichlorophenol. It is not known if this breakdown product is more or less harmful than 1,4-dichlorobenzene itself.

More information on how 1,4-dichlorobenzene enters and leaves the body is found in Chapter 2.

## 1.5 HOW CAN 1,4-DICHLOROBENZENE AFFECT MY HEALTH?

Inhaling the vapor or dusts of 1,4-dichlorobenzene at very high concentrations (much higher than you would be exposed to in the home) can be very irritating to your lungs. It may also cause burning and tearing of the eyes, coughing, difficult breathing, and an upset stomach. There is no evidence that the moderate use of common household products that contain 1,4-dichlorobenzene will result in any problems to your health. There are some medical reports of patients who have developed some health effects, such as dizziness, headaches, and liver problems as a result of very high levels of 1,4-dichlorobenzene in the home. However, these were reports of extremely high usage of 1,4-dichlorobenzene products, and the persons continued to use the products for months or even years, even though they felt ill. There are also cases of people who have eaten 1,4-dichlorobenzene products regularly for long periods (months to years) because of its sweet taste. This has caused skin blotches and problems with red blood cells, such as anemia. There is no direct evidence that 1,4-dichlorobenzene causes cancer in humans. Workers breathing high levels of 1,4-dichlorobenzene (80-160 ppm) have reported painful irritation of the nose and eyes. There is very little information on the effects of skin contact with 1,4-dichlorobenzene. 1,4-Dichlorobenzene can cause a burning feeling in your skin if you hold a block of 1,4-dichlorobenzene against your skin for a long time.

To protect the public from the harmful effects of toxic chemicals and to find ways to treat people who have been harmed, scientists use many tests.

One way to see if a chemical will hurt people is to learn how the chemical is absorbed, used, and released by the body; for some chemicals, animal testing may be necessary. Animal testing may also be used to identify health effects such as cancer or birth defects. Without laboratory animals, scientists would lose a basic method to get information needed to make wise decisions to protect public health. Scientists have the responsibility to treat research animals with care and compassion. Laws today protect the welfare of research animals, and scientists must comply with strict animal care guidelines.

In laboratory animals, breathing or eating 1,4-dichlorobenzene can cause harmful effects in the liver, kidneys, and blood. Rats and mice given oral doses of 1,4-dichlorobenzene in lifetime studies had increased rates of liver cancer when compared with animals that did not receive 1,4-dichlorobenzene.

We do not definitely know if 1,4-dichlorobenzene plays a role in the development of cancer. The Department of Health and Human Services (DHHS) has determined that 1,4-dichlorobenzene may reasonably be anticipated to be a carcinogen in humans. The International Agency for Research on Cancer (IARC) has determined that 1,4-dichlorobenzene is possibly carcinogenic to humans. The EPA has determined that 1,4-dichlorobenzene is a possible human carcinogen.

There is no reliable evidence that suggests that 1,4-dichlorobenzene affects reproduction in humans. More information on how 1,4-dichlorobenzene can affect your health is given in Chapter 2.

## **1.6 HOW CAN 1,4-DICHLOROBENZENE AFFECT CHILDREN?**

This section discusses potential health effects from exposures during the period from conception to maturity at 18 years of age in humans. Potential effects on children resulting from exposures of the parents are also considered.

Children are exposed to 1,4-dichlorobenzene in many of the same ways that adults are. There is a possibility that 1,4-dichlorobenzene used in the home can be accidentally swallowed, especially by young children. When 1,4-dichlorobenzene is used in mothballs or toilet bowl deodorant blocks, these products may be freely available in closets or bathrooms. Although most of the exposure pathways for children are the same as those for adults, children may be at a higher risk of exposure because of their lack of consistent hygiene practices and their curiosity about unknown powders and liquids.

Children who are exposed to 1,4-dichlorobenzene would probably exhibit the same effects as adults, although there is very little information on how children react to 1,4-dichlorobenzene exposure. Thus, all health effects observed in adults are of potential concern in children.

There are no studies in humans or animals showing that 1,4-dichlorobenzene crosses the placenta or can be found in fetal tissues. Based on other chemicals like 1,4-dichlorobenzene, it is possible that it could cross the placenta and be found in fetal tissues. There is no credible evidence that suggests that 1,4-dichlorobenzene causes birth defects. One study found dichlorobenzenes in breast milk, but 1,4-dichlorobenzene has not been specifically measured.

### **1.7 HOW CAN FAMILIES REDUCE THE RISK OF EXPOSURE TO 1,4-DICHLOROBENZENE?**

If your doctor finds that you have been exposed to significant amounts of 1,4-dichlorobenzene, ask your doctor if children may also be exposed. When necessary your doctor may need to ask your state Department of Public Health to investigate.

You and your children can be exposed to 1,4-dichlorobenzene in your home if you use products such as 1,4-dichlorobenzene-treated toilet bowl cleaners or mothballs containing 1,4-dichlorobenzene. You should not let your child play with or drink toilet bowl water that has been treated with 1,4-dichlorobenzene. Do not let your children rub mothballs or cleaners containing 1,4-dichlorobenzene on their skin. Because 1,4-dichlorobenzene may be found in the home as a pesticide and bathroom deodorizer and in mothballs, these items should be stored out of reach of young children to prevent accidental poisonings. Always store household chemicals in their original labeled containers; never store household chemicals in containers children would find attractive to eat or drink from, such as old soda bottles. Keep your Poison Control Center's number by the phone.

**1.8 IS THERE A MEDICAL TEST TO DETERMINE WHETHER I HAVE BEEN EXPOSED TO 1,4-DICHLOROBENZENE?**

There are tests that can be used to find out if you have been exposed to 1,4-dichlorobenzene. The most commonly used test measures its breakdown product, 2,5-dichlorophenol, in urine and blood. These tests require special equipment that is not routinely available in a doctor's office, but they can be performed in a special laboratory.

The presence of the compound 2,5-dichlorophenol in the urine indicates that the person has been exposed to 1,4-dichlorobenzene within the previous day or two. This test has been used in industrial settings in surveys of workers exposed to 1,4-dichlorobenzene. Another test measures levels of 1,4-dichlorobenzene in your blood, but it is less commonly used. Neither of these tests can be used to find out how high the level of 1,4-dichlorobenzene exposure was or to predict whether harmful health effects will follow.

More information on how 1,4-dichlorobenzene can be measured in exposed humans is presented in Chapters 2 and 6.

**1.9 WHAT RECOMMENDATIONS HAS THE FEDERAL GOVERNMENT MADE TO PROTECT HUMAN HEALTH?**

The federal government develops regulations and recommendations to protect public health.

Regulations can be enforced by law. Federal agencies that develop regulations for toxic substances include the Environmental Protection Agency (EPA), the Occupational Safety and Health Administration (OSHA), and the Food and Drug Administration (FDA).

Recommendations provide valuable guidelines to protect public health but cannot be enforced by law. Federal organizations that develop recommendations for toxic substances include the Agency for Toxic Substances and Disease Registry (ATSDR) and the National Institute for Occupational Safety and Health (NIOSH).



Regulations and recommendations can be expressed in not-to-exceed levels in air, water, soil, or food that are usually based on levels that affect animals, then they are adjusted to help protect people. Sometimes these not-to-exceed levels differ among federal organizations because of different exposure times (an 8-hour workday or a 24-hour day), the use of different animal studies, or other factors.

Recommendations and regulations are also periodically updated as more information becomes available. For the most current information, check with the federal agency or organization that provides it. Some regulations and recommendations for 1,4-dichlorobenzene include the following:

The federal government has taken a number of steps to protect people from excessive 1,4-dichlorobenzene exposure. EPA has listed 1,4-dichlorobenzene as a hazardous waste and has subjected it to hazardous waste regulations. EPA has set a maximum level of 75 µg of 1,4-dichlorobenzene per liter of drinking water. In addition, 1,4-dichlorobenzene is a pesticide registered with EPA, and its manufacturers must provide certain kinds of information to EPA in order for it to be registered for use as a pesticide. OSHA has set a maximum level of 75 ppm for 1,4-dichlorobenzene in workplace air for an 8-hour day, 40-hour work week.

More information on federal and state regulations regarding 1,4-dichlorobenzene is presented in Chapter 7:

#### **1.10 WHERE CAN I GET MORE INFORMATION?**

If you have any more questions or concerns, please contact your community or state health or environmental quality department or

Agency for Toxic Substances and Disease Registry  
Division of Toxicology  
1600 Clifton Road NE, Mailstop E-29  
Atlanta, GA 30333

\* Information line and technical assistance

Phone: 1-800-447-1544

Fax: (404) 639-6359

ATSDR can also tell you the location of occupational and environmental health clinics. These clinics specialize in recognizing, evaluating, and treating illnesses resulting from exposure to hazardous substances.

\* To order toxicological profiles, contact

National Technical Information Service  
5285 Port Royal Road  
Springfield, VA 22161  
Phone: (800) 553-6847 or (703) 487-4650